Make a **Bold** Impact on Air Quality **Today**

Natural gas vehicles can transform our nation’s medium- and heavy-duty transportation sector & are the most cost-effective choice for VW settlement funds.
NGVAmerica is the national organization dedicated to the development of a growing, profitable, and sustainable marketplace for vehicles powered by natural gas and for using more natural gas in transportation.

NGVAmerica represents 200+ companies, LDCs, fleets, OEMS, environmental and government organizations.
The Problem

Urban Emissions & Public Health
Urban Emissions: Leading Sources

74% of heavy-duty trucks not certified to latest NOx emission standard

26% of heavy-duty trucks meet NOx emissions standard

#1 Source of Urban Emissions
- Short-Haul
- Refuse
- Long-Haul
- School Buses
- Transit Buses

Source: DTF Analysis on HIS Vehicles in Operation Data, December 2015
Urban Emissions: Public Health Impacts

Breathing in particle pollution increases the risk of:

- Asthma
- Lung Cancer
- Heart Disease
- Premature Death

≈ 50% of Americans live in areas with air that is unhealthy to breathe

Source: American Lung Association's "State of the Air 2016"
The Opportunity

Volkswagen Environmental Mitigation Trust Funding
Funding must be used to:

- Address excess nitrogen oxide (NOx) emissions through vehicle purchases/repowers
- Benefit residents in areas with greatest need (e.g., near urban/industrial areas)
- Replace polluting diesel equipment with cleaner, new or repowered vehicles, including:
  - Local freight trucks
  - Transit buses
  - School buses
  - Shuttle buses
  - Refuse trucks
### Funds for Each State ($2,925,000,000)

<table>
<thead>
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<th>Initial Subaccounts</th>
<th>Combined Totals</th>
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<td>Tribal Admin Cost</td>
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<td>Trust Admin Cost</td>
<td>$29,250,000.00</td>
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Tribal acct $54,447,921.22
Tribal Admin Cost $1,088,958.42
Trust Admin Cost $29,250,000.00
The Solution

Natural Gas Vehicles: Sustainable, Responsible, Available
Sustainable

NGVs Offer Unmatched Emission Reduction Benefits
The cleanest heavy-duty truck engine in the world is powered by natural gas

- Certified in 2015 by the U.S. Environmental Protection Agency and California Air Resources Board

The Cummins Westport Ultra-Low NOx engine is certified to a 0.02 g/bhp-hr standard, which is:

- 90% cleaner than the EPA’s current NOx standard
- 90% cleaner than the latest available diesel engine
Cummins Westport Optional Near Zero Product Line

**ISB6.7 G**

- 6.7L
- Spark Ignited, SEGR, TWC
- Peak Rating: 240 hp
- 560 lb-ft torque
- 33,000 lb. GVW
- School bus/Shuttle bus/Sweeper/Yard spotter
- 0.1 g/bhp NOx Available Now

**ISL G**

- 8.9L
- Spark Ignited, SEGR, TWC
- Peak Rating: 320 hp
- 1000 lb-ft torque
- 66,000 lb. GVW
- Refuse/Transit/Regional P&D Truck/Mixers
- NZ Available Now

**ISX12 G**

- 11.9L
- Spark Ignited, SEGR, TWC
- Peak Rating: 400 hp
- 1450 lb-ft torque
- 80,000 lb. GVW
- Regional Haul Truck/Tractor/Refuse
- NZ Available Q1 2018
In-use testing results of heavy-duty trucks in port applications found:

» **Natural gas vehicles emitted lower NOx:**

The ISL G natural gas engine emitted lower NOx emissions than its EPA certification standard. Emissions decreased as the duty cycles decreased (i.e., slower speeds, idling, stop-and-go traffic).

» **Diesel vehicles emit up to 5x more NOx:**

2010 diesel engines with SCR emitted up to 5 times more NOx emissions than its EPA certification standard. Emissions increased as the duty cycles decreased.
Fueling with natural gas reduces CO$_2$ and greenhouse gas emissions

Natural Gas Reduces WTW Greenhouse Gas Emissions

Compared to Diesel:

- LNG: 11% reduction
- CNG: 17% reduction

Source: NGVAmerica Emissions Whitepaper based on CARB LCFS

*Numbers compared to diesel emissions (well-to-wheel)
Renewable natural gas (RNG) provides even greater CO₂ and greenhouse gas emission reductions.

Carbon Intensity Rating of Key Transportation Fuels

<table>
<thead>
<tr>
<th>Transportation Fuel</th>
<th>EER-Adjusted Carbon Intensity</th>
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<tbody>
<tr>
<td>Diesel (conventional)</td>
<td>102.01</td>
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<tr>
<td>Natural gas (conventional)</td>
<td>88.60</td>
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<tr>
<td>Hydrogen (from natural gas)</td>
<td>55.61</td>
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<td>Electricity (California grid)</td>
<td>38.95</td>
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<tr>
<td>RNG - Landfill gas</td>
<td>33.89 to 65.64</td>
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<tr>
<td>RNG - Wastewater biogas</td>
<td>8.61 to 34.36</td>
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<tr>
<td>RNG - Food/green waste biogas</td>
<td>-25.48</td>
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<tr>
<td>RNG – Dairy biogas (prospective)</td>
<td>-303.30</td>
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What does this really mean?

NGVs + RNG offer the **cleanest commercially available path** to reduce heavy-duty vehicle emissions (for likely a decade or more).
Responsible

NGVs Maximize the Impact of Available Funding
Short/Regional Haul Truck Comparison – 100% Funding Scenario

Dollar-for-Dollar, NGVs Deliver the Largest & Most Cost-Effective NOx Emissions Reductions

Data Source: NOx emissions are based on low-NOx natural gas engines. EV emissions are the same as natural gas emissions based on the inclusion of power plant emissions, EPA MOVES emission factors for 2017 diesel vehicle, and EPA MOVES for 2007 replacement diesel vehicles. Useful life, cost and mileage vary by applications. Additional details available from NGVA upon request.
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Dollar-for-Dollar, NGVs Deliver the Largest & Most Cost-Effective NOx Emissions Reductions
Depending on range and application, fleets can realize a payback in as little as 18–24 months due to:

- Lower fuel costs
- Lower maintenance costs
Available

NGVs are Road-Tested & Commercially Available
Available from OEMs with established sales and service networks

**HD Vocational OEMs**
- Autocar Truck
- Capacity
- Crane Carrier
- Elgin
- Johnston
- Kalmar
- Mack
- McNeilus
- Peterbilt
- Power Solutions Int’l
- Schwarze
- Tymco

**HD Bus OEMs**
- Blue Bird Bus
- DesignLine
- El Dorado
- Gillig
- New Flyer
- New Flyer/NABI Bus
- NOVA Bus
- Motor Coach Industries
- Thomas Built Bus

**HD Retrofit/ Repowers**
- American Power Group
- Clean Air Power
- Diesel 2 Gas
- Fyda Energy Solutions
- NGV Motori
- Omnitek Engineering

**MD Retrofits**
- AGA Systems
- Altech-Eco
- Crazy Diamond Performance
- Greenkraft
- Landi Renzo USA/Baytech
- M-Tech Solutions
- Nat-G
- NGV Motori USA
- PowerFuel Conversions
- Roush CleanTech
- STAG
- Westport Fuel Systems
- Zavoli

**Fuel Systems**
- Agility Fuel Solutions
- Momentum Fuel Technologies
- Mainstay
Class 4-6 Vehicles and NGV Availability

Class Four: 14,001 - 16,000 lbs.
- City Delivery
- Conventional Van
- Landscape Utility
- Large Walk In

Class Five: 16,001 - 19,500 lbs.
- Bucket
- City Delivery
- Large Walk In

Class Six: 19,501 - 26,000 lbs.
- Beverage
- Rack
- School Bus
- Single Axle Van
- Stake Body
Class 4-6 Vehicles and NGV Availability
Class 7-8 Vehicles and NGV Availability
Class 7-8 Vehicles and NGV Availability
School/Transit Bus and NGV Availability
Refuse Vehicles and NGV Availability
Non-Road, High Horsepower Applications
Non-Road, High Horsepower Applications
NGVs are road-tested, proven technologies that are operating worldwide.

Data Source: NGVGlobal, December 2016
Several high-profile fleet operators use NGVs in daily operations.
Advantages of Natural Gas as a Transportation Fuel

Abundant Domestic Availability, Widespread Distribution Infrastructure, Low Cost and Price Stability
North America has an abundant domestic supply of conventional natural gas.

Source: U.S. Energy Information Administration, January 2017
North America has abundant sources of renewable natural gas that can be harnessed.

Source: Coalition for Renewable Natural Gas, 2017
Renewable natural gas production is steadily increasing to meet growing demand throughout the U.S.

RNG PRODUCTION FOR TRANSPORTATION FUEL

GREW BY 5X BETWEEN 2013 AND 2015

25.9 M EGE VS 139.8 M EGE

IS ON PACE TO TRIPLE IN VOLUME BY 2018

481.5 M EGE PROJECTED

Source: Coalition for Renewable Natural Gas, 2017
Natural gas fuel station infrastructure is continually expanding.

- More than doubled past 5 years
- 10-12+ new stations per month

≈2,000 Natural Gas Stations

Source: NGVAmerica, January 2017
Diverse network of natural gas station developers

- Natural gas retail fuel sellers
- LDCs
- C-Stores
- Truck Stops
- Grocery/Warehouse stores
- Leasing companies
- Gas exploration & production
- Midstream pipeline
The U.S. natural gas pipeline system is well poised to support a national network of CNG and LNG fueling stations.

2.5+ million miles of U.S. pipeline infrastructure.
Natural Gas Provides Long-Term Fuel Cost Savings

Natural Gas vs. Oil:
- 3:1 price advantage over oil on a Btu basis
- Pump prices $0.75 to $1 lower than diesel

Source: U.S. Energy Information Administration
Natural Gas Provides Fuel Price Stability

**Natural Gas:**
- Decades of affordable domestic reserves
- Natural gas sourced from North America
- Commodity cost makes up 23% of sales price

**Diesel:**
- History of volatile price swings
- Crude oil sourced fuel from high-conflict regions
- Commodity cost makes up 60% of sales price
Natural gas vehicles are up to 3x quieter than their diesel counterparts and significantly reduce noise pollution in the local community.
Conclusion: NGVs are the Best Value for State VW Funds
NGV America Recommendations

- Fund **alternative** fuel vehicle projects that maximize NOx reductions for the funds spent for both public and private fleets
- Provide greater funding for MD & HD vehicles powered or repowered by engines that deliver NOx reductions **greater** than current EPA standards
- Target funding for technologies that have demonstrated **lower in-use** emissions
- Prioritize funding for projects with commercially **available** products
- Stay flexible in plans and **leverage private investment** to stretch dollars and get more **alternative** vehicles on the road
For more information:

Jeff Clarke – jclarke@ngvamerica.org
Sherrie Merrow – smerrow@ngvamerica.org

Visit: www.ngvamerica.org